

## **REMARKS**

Favorable reconsideration and allowance of this application are requested.

### **1. Discussion of Amendments**

By way of the amendment instructions above, claim 1 has been revised so as to clarify that step (b) is conducted "continuously". Accordingly, claim 5 has been cancelled. Claim 1 has also been amended so as to clarify that the  $\Delta PAN_{Ni} \leq 3$  is for a period of at least 3 months, support for which can be found in Example 1 at page 9, lines 31-32 ("*Over a period of three month....*").

Claim 21 has been amended so as to be in independent form and thus now contains all the language of claim 1 from which it previously depended. In addition, claim 21 has been revised so as to address the embedded alternative nickel amounts which now appear in new claims 22-25.

Claim 26 is based on pending claim 16, but is dependent from the amended version of claim 21.

Thus, following entry of the present amendment, claims 1-4 and 6-26 will remain pending herein for which favorable action is solicited.

### **2. Response to 35 USC §112 Rejection**

The claim amendments presented herewith are believed to address fully the rejection advanced under 35 USC §112, second paragraph. Withdrawal of the same is therefore believed to be in order.

### 3. Response to 35 USC §102(b) Rejection

Prior claims 1-21 attracted a rejection under 35 USC §102(b) as allegedly anticipated by Planterna et al (EP 138241). Applicants suggest that Planterna et al is inappropriate as a reference against the amended pending claims presented herewith.

In this regard, the applied Planterna et al publication is cited and discussed already in the originally filed specification of the subject application at page 1, lines 22-28. As noted, Planterna et al relates to recovery of  $\epsilon$ -caprolactam from  $\epsilon$ -caprolactam-containing distillation residues, by means of a process comprising the steps of vacuum distillation and (after mixing of the  $\epsilon$ -caprolactam with water) hydrogenation whereafter the  $\epsilon$ -caprolactam is recovered (e.g. by distillation or by extraction). The PAN number of the  $\epsilon$ -caprolactam so obtained, however, is still relatively high and should be improved, in particular if the process is to be operated continuously for periods of at least 3 months.

The present invention as defined by the pending claims herein is, for example, based upon the finding of the problem that the presence of nickel in the distillation column at specific amounts during distillation of purified hydrogenated  $\epsilon$ -caprolactam leads to unexpected deterioration of the PAN number of the  $\epsilon$ -caprolactam so obtained. The applicants do not know of such a problem ever having been observed before. Certainly it is not disclosed in Planterna et al. Nor is there any hint in Planterna et al as to any effects of the presence of amounts of nickel in the distillation column with respect to the PAN-number of the product obtained, and more particularly results with respect to values of  $\Delta\text{PAN}_{\text{Ni}}$ . It is, moreover, not disclosed or suggested in Planterna et al that the distillation step applied in the process of the present invention can be performed ***continuously for a period of at least 3 months.***

Accordingly, the problem underlying the present invention is not merely finding an improved process for caprolactam purification. Instead, the present invention may

be characterized as an improved process for caprolactam purification by avoiding deterioration during distillation. Such avoidance of deterioration during distillation is not known at all from Plantema et al. Moreover, even though there is abundant literature known as to purification of caprolactam by hydrogenation followed by distillation, the particular solution to the problem is not suggested therein since the problem was not known.

The presently pending claims emphasize the continuous character of the distillation and the period of operation of at least 3 months. For these reasons alone, the presently claimed invention is novel over Plantema et al.

Moreover, the experimental results shown in Example I of Plantema et al do not give any clue as to PAN number or values for  $\Delta\text{PAN}_{\text{Ni}}$ , but merely show relatively high PAN numbers.

Thus, in summary, as mentioned above, Plantema et al does not teach or disclose that presence of nickel in distillation columns can give rise to formation of unsaturated lactams. This finding is addressed in the paragraph at the middle of page 3 of the originally filed specification, wherein it is stated that:

"It has surprisingly been found that the presence of nickel in the distillation column has proved to be the cause of the deterioration of the quality of the caprolactam during said distilling inasmuch as nickel readily convert caprolactam into so-called unsaturated lactams (UCL)

Further, please note the bottom part of page 3 of the originally filed specification wherein it is stated taht:

"It was not to be expected that the quality deterioration during distilling of the hydrogenated caprolactam was

caused to a large extent by the presence of nickel in the hydrogenated caprolactam fed to the said distilling step. It has in fact been found that, although customary techniques are applied for separating catalyst particles from the hydrogenated caprolactam, the hydrogenated caprolactam, obtained after such separation still comprises nickel. In addition, formation of unsaturated lactams may be caused by other types of chemical reactions, like for example oxidation, and/or may be caused by the presence of impurities in compounds used in the various chemical steps to produce caprolactam. Moreover, nickel is not generally known to form unsaturated lactams from caprolactam under the usually applied distillation conditions."

Thus, in view of the amendments and remarks above, applicants suggest that the presently claimed invention cannot be anticipated or rendered obvious by Plantema et al. Withdrawal of all rejections based thereon is therefore in order.

#### **4. Information Disclosure Statement**

The Examiner's attention is directed to the following commonly owned patent applications that may be deemed relevant generally to the present invention:

<u>Serial No.</u>	<u>Filing Date</u>	<u>Attv. Dkt. No.</u>	<u>Art Unit</u>	<u>Examiner</u>
10/557,753	Nov. 21, 2005	4662-107	1624	Kifle
10/557,771	Nov. 29, 2006	4662-106	1624	Kifle
10/557,770	Nov. 21, 2005	4662-104	1624	Kifle

The '753 and '771 applications have recently been allowed by Examiner Kifle and related generally to the production of caprolactam via a rearrangement process at low

water content of the oxime used and at specific molar ratio and SO<sub>3</sub>-content. The '770 application relates to production of caprolactam by a rearrangement process, with focus on the mixing conditions.

In addition to the commonly owned patent application noted above, the Examiner's attention is also directed to commonly owned US Patent No. 7,141,668 which issued on November 28, 2006 based on application Serial No. 10/495,862 filed on November 16, 2004 and examined by Examiner Kifle in Art Unit 1624. The '668 patent relates generally to the recovery of caprolactam.

Although it is believed that a clear line of patentable demarcation exists between the presently pending claims in the subject application and the copending applications and patent noted above, the Examiner's independent consideration of the same will be appreciated. For such purpose, a form listing the patent applications and patent cited above is attached. In addition, the fee required by Rule 97(c) is being submitted.

## **5. Conclusion**

All issues in the August 17, 2007 Official Action have been resolved. Therefore, early receipt of the Official Allowance Notice is solicited.

Should any small matters remain outstanding, the Examiner is encouraged to telephone the Applicants' undersigned attorney so that the same may be resolved without the need for an additional written action and reply.

An early and favorable reply on the merits is awaited.

## **6. Fee Authorization**

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed

**LEMMENS et al**  
**Serial No. 10/565,774**  
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herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Respectfully submitted,

**NIXON & VANDERHYE P.C.**

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